

REMARKS

Claims 1 and 16 are amended to delete recital to the physical separation occurring "about simultaneously" with the hemicellulose precipitation. These amendments to claims 1 and 16 do not add new matter.

The preambles of claims 1, 16 and 18 are amended to recite that the present invention is a process for the separation of hemicellulose from insoluble cellulose and cellulose-hemicellulose complexes in caustic liquor from solubilizing fiber with alkali. These amendments to the preambles provide a better description of the present invention thereby distinguishing the process of the present invention from the hemicellulose removal method disclosed in the art cited by the Examiner in the Office Action. Claim 16 is also amended to delete recitation to the hemicellulose being removed from the caustic liquor in accordance with the better description of the invention as set forth in the amended claims. These amendments to claims 1, 16 and 18 are supported in the specification, including at ¶¶ 0001 and 0007.

Claims 1, 16 and 18 are amended to recite that hemicellulose floats on top of the caustic liquor and alcohol. These amendments to claims 1, 16 and 18 are supported in the specification, particularly at ¶¶ 0001 and 0007, especially considering that alcohol is added to the caustic liquor for the precipitation which discloses to one skilled in the art that the hemicellulose will float on both the caustic liquor and alcohol since both are necessarily present for the precipitation.

Claims 1, 16 and 18 are also amended to recite that the ratio of alcohol to water in the caustic liquor is about 3:1 to about 9:1. These amendments are supported in the specification, including at ¶0012. Further, with respect to claims 1 and 16, the limitations of claims 4 and 17, which were directly or indirectly dependent from claims 1 and 16, respectively are written into the Independent claims. Hence, these amendments to claims 1, 16 and 18 do not add new matter. Claims 3, 4, 17 and 20 are, accordingly, canceled.

Claim 1 is further amended to recite that the density separation of the floating hemicellulose precipitates from the insoluble cellulose and cellulose-hemicellulose complexes in caustic liquor. This amendment to claim 1, as well as similar amendments to the preambles of claim 1, as well as claims 16 and 18, as discussed above, are supported in the Specification including at ¶ 0007, and in ¶ 0001 particularly where it is stated "The hemicellulose physically separates from the impurities, including cellulose and cellulose-hemicellulose complexes, by floating to the top of the caustic liquor after precipitation with alcohol. Density separation techniques are used to separate the floating precipitated hemicellulose simultaneously, or about simultaneously, with the formation of floating hemicellulose precipitate. The insoluble cellulose and cellulose-hemicellulose complexes can be removed from the caustic liquor by a further separation step."

The applicants have elected to cancel claims 2, 15 and 19 from the instant application. Further, claim 16 is amended to delete recitation to a second separation step to remove the insoluble components from the caustic liquor in

light of the scope of the invention in the instant application as set forth in the amended claims. The claim cancellations and amendments, in this regard, are without prejudice and the applicant reserves the right to assert claims as to subject matter canceled in the instant application in a continuation application.

At page 2 of the Office Action, the Examiner rejects claims 1-17 under 35 U.S.C. § 112 (second paragraph) as being indefinite for failing to particularly point out and distinctly claim the subject matter which the applicant regards as the invention. Reconsideration and withdrawal of this rejection is respectfully requested.

The Examiner asserts that the metes and bounds of the term "about simultaneously" in claim 1 cannot be determined thereby rendering the claim, as well as claims 2-17, indefinite. Claims 1 and 16 are amended to remove recitation of "about simultaneously" from the claims. Thus, claims 1-17, as amended, are not indefinite and are in compliance with all requirements of 35 U.S.C. § 112 (second paragraph).

Also, the applicant notes that claim 18 recites that the separation occurs before the precipitated hemicellulose absorbs sufficient water to cause it to swell and settle into the caustic liquor. Hence, the amendments to claims 1 and 16 deleting recitation to "about simultaneously" should not be construed as abandoning claimed subject matter wherein the separation does not occur simultaneously with the precipitation, which subject matter remains encompassed by the scope of the limitations of claim 18 of separating the

floating hemicellulose before it absorbs sufficient moisture to cause it to swell and settle into the caustic liquor.

At pages 2-3 of the Office Action, the Examiner rejects claims 1-3, 5-7, 10, 11 and 14-16 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 3,935,022 to Sihtola ("Sihtola"). Reconsideration and withdrawal of this rejection is respectfully requested.

Claims 1 and 16 are independent claims and are amended herein to incorporate the limitations of claims 4 and 17, respectively, that that process requires a ratio of alcohol to water in the caustic liquor of about 3:1 to about 9:1. Claims 4 and 17 are not subject to the rejection that the claims are anticipated by Sihtola. Furthermore, Sihtola does not expressly or inherently disclose the alcohol to water ratios of about 3:1 to about 9:1. Rather, Sihtola discloses, as noted by the Examiner, caustic liquor: alcohol ratio in the range of 2:1 to 1:2 (and, thus an alcohol: caustic liquor ratio in the range of 2:1 to 1:2), which is significantly different from the alcohol: water ratio range in the caustic liquor of about 3:1 to about 9:1, as set forth in the amended claims. As such, the present invention, as set forth in the amended claims, is not anticipated by Sihtola.

At pages 4-6 of the Office Action, the Examiner rejects claims 1-20 under 35 U.S.C. § 103(a) as being obvious over Sihtola.¹ Reconsideration and withdrawal of this rejection is respectfully requested.

The Examiner asserts that example 1 of Sihtola discloses a process for precipitation of hemicellulose involving dissolved pulp comprising alpha cellulose being mercerized using NaOH solution containing hemicellulose, recovering press liquor, adding ethanol and then separation by centrifugation. The Examiner further notes that example 4 discloses a steeping liquor comprising 18.4% NaOH and 51.8 g/l of hemicellulose, steeping liquor: ethanol ratios of 2:1, 1.5:1, 1:1, 1:1.5 and 1:2 and centrifugation. The Examiner also refers to disclosure of Sihtola at column 2 as purportedly disclosing separation of precipitate from purified caustic liquor to recover substantially purified caustic liquor. On this basis, the Examiner concludes that, assuming the starting materials used in Sihtola are the same as the starting materials recited in the claims, the hemicellulose precipitated in Sihtola floats on top of the caustic liquor and is separated immediately after being precipitated. The Examiner further asserts that a Greenshields patent discloses adding peroxide and argues that one skilled in the art would be motivated to combine Sihtola with Greenshields

¹ In the text of Office Action, the Examiner refers to a Greenshields patent as purportedly showing the addition of peroxide (likely as per claims 12 and 13, which are directly or indirectly dependent from claim 1). The Examiner does not expressly identify the Greenshields patent in the claim rejection (see, first sentence of section 6 of the Office Action at page 4). Regardless, because as discussed herein, claim 1 is not obvious over Sihtola, it follows that claims 12 and 13 would not be obvious over Sihtola combined with a secondary reference.

and that it would have been obvious to include the step of adding peroxide in view of Greenshields.

The present invention involves a novel process for separating hemicellulose from insoluble cellulose and cellulose-hemicellulose complexes in caustic liquor from solubilizing fiber with alkali. In the process, precipitated hemicellulose floats while insoluble cellulose and cellulose-hemicellulose complexes sit at the bottom of the solution, and the floating hemicellulose can be separated by physical separation. The process is premised on the discovery that hemicellulose will float when precipitated by the addition of alcohol to achieve an alcohol to water ratio in the caustic liquor of about 3:1 to about 9:1. Indeed, the claims have been amended to recite that the alcohol to water ratio of the claimed process is about 3:1 to about 9:1. As discussed in the specification, alcohol to water ratios within this preferred range are generally necessary to obtain the floating precipitate needed for the process of the present invention. (See, specification at ¶ 0012). This allows the hemicellulose to be separated from the cellulose and hemicellulose-cellulose complexes and removed by physical separation, such as decantation, either simultaneously with the precipitation or prior to the hemicellulose settling into the caustic liquor. As such, the novel and unique process of the present invention provides tremendous cost savings compared to conventional methods.

Sihtola concerns using ethanol to precipitate hemicellulose (or any alkali-dissolved hydrocolloid) from caustic liquor to remove hemicellulose and thus purifying the caustic liquor, but does not teach or suggest the process for

separating hemicellulose from insoluble cellulose and cellulose-hemicellulose complexes in caustic liquor from solubilizing fiber with alkali in order to obtain purified hemicellulose as set forth in the amended claims. There is no mention in Sihtola that the methods taught in that patent serve to separate the cellulose from insoluble cellulose and cellulose-hemicellulose complexes as in the present invention. Rather, the goal and teaching of Sihtola is merely to remove the hemicellulose, regardless of what other materials may be carried along with the hemicellulose, so that the caustic liquor becomes useful for further circulation. (See, Sihtola at col. 2, lines 44-56.) This is not the present invention wherein the hemicellulose is separated from insoluble components of caustic liquor. Accordingly, Sihtola does not teach or suggest the processes claimed in the instant application. Hence, the present invention, as set forth in the amended claims, is not obvious over Sihtola.

Moreover, Sihtola teaches of a hemicellulose removal process using steeping liquor to alcohol ratios of 1:2 to 2:1 and provides absolutely no teaching or suggestion of processes for separating hemicellulose from cellulose and cellulose-hemicellulose complexes with alcohol to water ratios of about 3:1 to about 9:1, and the claims are amended accordingly. As discussed in the specification, this alcohol to water ratio precipitates the hemicellulose so that the hemicellulose floats atop the caustic liquor and alcohol allowing the use of physical separation simultaneously with the precipitation or before the precipitate absorbs sufficient water to cause it to swell and settle into the caustic liquor. Sihtola does not teach or suggest the use of alcohol in the alcohol to water ratios

set forth in the amended claims and, further, does not teach of utilizing such ratios in a process to separate hemicellulose, by use of physical separation, as a floating precipitate either by separation simultaneously with precipitation or to separate floating precipitate before the precipitate absorbs sufficient water to cause it to swell and settle into the caustic liquor. Accordingly, the present invention, as set forth in the amended claims, is not obvious over Sihtola.

Furthermore, the disclosure of Sihtola negates any assertion that the method taught in this reference separates the floating hemicellulose simultaneously with the precipitation or before the hemicellulose swells and settles into the caustic liquor. In both Examples 1 and 2 of Sihtola, it is stated that "... the precipitates formed were separated from the solutions by centrifugation...." (See, Sihtola at col. 5, lines 20-21 and 41-42.) Examples 3-5 refer to the separation process of Examples 1 and 2. Considering the use of the past tense with respect to the formation of the precipitates in relation to the separation in Sihtola, one skilled in the art is taught by this reference to separate after the hemicellulose precipitate is formed and not, as in the present invention, to separate simultaneously or prior to the hemicellulose swelling. Indeed, the inventor has discovered that alcohol to water ratio of 3:1 to 9:1 which allows for the hemicellulose to float and facilitates the simultaneous, or near simultaneous, separation. Thus, Sihtola fails to teach or suggest the separation of precipitated hemicellulose simultaneously or prior to swelling as set forth in the amended claims. Therefore, the present invention, as set forth in the amended claims, is not obvious over Sihtola.

Considering that the process as set forth in the amended claims is not obvious over Sihtola, the process cannot, likewise, be obvious over Sihtola and any of the Greenshields patents of record in the instant application, or any other piece of prior art for that matter. The Examiner cites Greenshields to assert that it is known to add peroxide to a preparation comprising hemicellulose. As discussed above, however, Sihtola fails to teach or suggest the process of the present invention for separating purified hemicellulose from cellulose and cellulose-hemicellulose complexes wherein an alcohol to water ratio in the caustic liquor of about 3:1 to about 9:1 is used to precipitate hemicellulose so that the hemicellulose floats on top and can be separated simultaneously with the precipitation or before the hemicellulose swells and settles into the caustic liquor. Thus, the combination of Sihtola with Greenshields cannot teach or suggest the precise process of the present invention, as set forth in the amended claims, with the additional step of adding peroxide. In other words, because the primary steps of the process, such as those set forth in the amended independent claims, are not obvious over Sihtola, this process with a further step of adding peroxide cannot be obvious over Sihtola in view of Greenshields. Based on the foregoing, the present invention, as set forth in the amended claims, is not obvious over Sihtola in view of Greenshields.

Conclusion

The instant application is believed to be in condition for allowance. A Notice of Allowance of claims 1, 5-14, 16 and 18 is respectfully requested. The Examiner is invited to telephone the undersigned at (908) 722-0700 if it is

believed that further discussions, and/or additional amendment would help advance the prosecution of the instant application.

If any additional extension of time for this response is required, the applicant requests that this be considered a petition therefor. Please charge any required petition fee to the Deposit Account No. 14-1263.

Please charge any insufficiency of fees, or credit any excess, to the Deposit Account No. 14-1263.

Respectfully submitted,


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